ceasing to be. A careful perusal has disclosed nothing that can give a well-intentioned critic occasion to say "this is a happy idea—that is capitally put—this is something to help us." On the contrary, if this book were to be reviewed in detail, it would be necessary to write columns of complaint. One feature of novelty appears in the book in the form of full-page illustrations of apparatus and materials used in all the experiments. These pictures are reproduced from photographs, and show three tiers of apparatus arranged as if for sale. In many cases it is not easy for an experienced chemist to recognise the individual pieces, and in plate xx. we reach a climax. It represents on the top shelf two tin canisters, a stoppered bottle, a Bunsen burner, a beaker, a tin dish, a blowpipe and another stoppered bottle. On the next shelf are three stoppered bottles, a hammer, four tin canisters, a small structure like a dog kennel, and a rack of twelve test-tubes. On the bottom shelf are two developing trays, a beaker, a stoppered bottle, a sugar basin, a stone gingerbeer bottle, a pocket handkerchief and apparently a bank-note or a shirt cuff. The plate bears the legend "The Metals." By the use of a lens one word of two of the labels can be deciphered.

A. S.

SOLID GEOMETRY.

The Elements of Euclid, Book XI. By R. Lachlan, Sc.D. Pp. 51. (London: Edward Arnold, n.d.) Price 1*s*.

IT is to be hoped that some of the scientific committees which are now dealing with the improvement of mathematical teaching, and more especially with that of the teaching of elementary geometry, will, in the process of pruning Euclid, direct attention to this little-read Book xi. As in other books of the Elements, many of the propositions are of the trivial, or even ludicrous, character, while some of the definitions lack precision. For example, can prop. 1—"one part of a straight line cannot lie in a plane and another part without the plane"—be seriously regarded as necessary? Indeed, the proof assumes the thing which it seeks to prove: let A B C be the given straight line; let a part of it, A B, lie in the plane, and a part, B C (if possible), out of the plane; produce A B *in the plane* to any point, D, &c. To this several other instances might be added.

Then as regards definition, the descriptions of dihedral, trihedral and (generally) polyhedral angles leave something to be desired. Possibly some better term than *angle* can be found in such cases. We are told that "when two planes meet and are terminated at their line of intersection, they are said to form a dihedral angle"; "when several planes meet in a point, they are said to form a polyhedral angle." All that such planes visibly "form" is a certain figure; the "angle" which they form (as it is employed in subsequent mathematics) is, in reality, an *area* on a sphere of unit radius. It is true that Book xi. is not concerned with this precise quantitative definition of (so-called) *solid angles*—better called *conical angles*—but merely with certain plane, or face, angles connected with them; nevertheless, it may be desirable to give the student, who when he reaches Book xi. can scarcely be called a *beginner*, this quantitative notion.

In the small compass of this book there is little opportunity for anything strikingly original or novel. Dr. Lachlan finishes it with an appendix which contains a large number of propositions, examples, &c., and this appendix will be found much more valuable than Book xi. itself.

A few criticisms of a minor character may not be out of place. We notice that in the enunciation of each proposition, Dr. Lachlan always uses the simple word "is" or "are" when the proposition states a fact which can be proved; thus, "if two planes intersect, their line of intersection is a straight line." The typical editor of a modern Euclid would say "their line of intersection *shall be* a straight line," employing a ridiculous compulsory form of expression. There is now the beginning of a revulsion against this style, which has been considered for some curious reason to be appropriate and essential to Euclid, but to no other subject of study or conversation. So far, Dr. Lachlan is in agreement with common sense; but why does he, when setting out on the proof of the proposition, re-state the fact with a "shall be"? Twice he forgot his rule—in prop. 1, where "must be" is employed, and prop. 14, where the simple and sensible "are" of the formal enunciation remains "are" in the re-statement.

The proof of prop. 20 would avoid a tendency to mislead the student if it stated that the point C is first taken (arbitrarily), then E, and finally B and D by drawing *any* line, E B D, through E.

In the third line of the proof of prop. 21, the proof is rendered very much more clear by the insertion of the word "all" before the words "the ∠s," the statement then being the very obvious one that if there are two sets of fifty plane triangles, the sum of all the angles in the first set is equal to the sum of all those in the second set.

Finally, the employment of the word "power" in the definition (p. 536) "the square on the distance between a point and the centre of a sphere less the square on the radius of the sphere is called the power of the point with respect to the sphere" does not seem justifiable or necessary, although it has been employed by a geometer of high repute. The word *power* is already employed in science for something quite different from the square of a tangent. Indeed, a student of electricity might be tempted to think that this geometrical "power of points" is a mere pun on the well-known term used in connection with frictional machines. Everything must not be sacrificed to brevity; if new terms are wanted in science, they should be appropriate and expressive.

BELGIAN BOTANICAL INVESTIGATIONS.

Recueil de l'Institut Botanique (Université de Bruxelles). Par L. Errera. Tome v. Pp. xii + 357. (Bruxelles: Henri Lamertin, 1902.)

IN this book there are brought together recent papers by botanists of the Royal Academy of Belgium, which have already been published in different journals during the last two years. Although this is the first volume to be published, it appears as vol. v., since the first four volumes will be given up to earlier papers. Thus

the five volumes will provide a systematic record of various lines of research, mainly physiological, which have been the subjects of investigation in the Botanical Institute of Brussels.

The nature of the alkaloids found in plants and the methods of localising them is one of these subjects, and in the present volume there are two papers dealing with those bodies, the one by the late M. George Clautriau, on "The Nature and Significance of Alkaloids in Plants," the other by E. Vanderlinden, treating of alkaloids in the Ranunculaceæ. A considerable part of Clautriau's paper is historical, the present research being confined to caffeine obtained from coffee and tea plants. Having previously studied the alkaloids in various other plants, he is well qualified to summarise our present knowledge of them. Although alkaloids have only been located in a limited number of plants, Clautriau considers that they are probably formed in all plants, but not always in sufficient quantity to be stored up. Alkaloids derived from purine bases are found throughout the whole range of plants, while those derived from a pyridine base are confined almost exclusively to Angiosperms. Definite microchemical tests for alkaloids are wanting; thus Clautriau was unable to obtain any which would enable him to detect caffeine *in situ*. He concludes that alkaloids are decomposition products formed in the breaking down of proteids; that they can be worked up again, but this requires a considerable expenditure of energy, and that generally their function is to protect the plant. Vanderlinden's results are quite in harmony with Clautriau's views. He finds that the amount of alkaloid present in a plant is liable to fluctuations, these depending upon the phase of vegetation and the nature of the soil. Curiously, Ranunculus and Clematis, two genera well known to possess toxic properties, yield no alkaloid.

In a second paper, Clautriau describes his experiments on pitcher-plants, some of which were performed on plants in their natural habitat in Java, others after his return to Brussels. Vines, who has reinvestigated the subject on the strength of Clautriau's results, does not confirm them, but decides that the ferment is tryptic, not peptic.

In the course of his experiments on the permeability of protoplasm to liquids at different temperatures, van Rysselburgh disproves the view held by Schwendener and others that protoplasm is not permeable to water at o° C.; in fact, he finds that it is permeable to potassium nitrate, urea, methylene-blue, &c., at the same temperature. Another important observation was made that the sap in a cell if isotonic with a certain solution at any temperature will be isotonic with it for all temperatures.

M. Jean Massart advances some decidedly unconventional ideas on the phylogeny of the lower organisms, which presumably have originated during his investigation of the protoplasm of the Schizophyta. His deductions as to the nature of the central body in the Schizophyceæ and the stainable bodies in Bacteria are somewhat convincing, but at present many problems of the nucleus seem to be beyond our powers of solution. The last few pages of the publication are devoted to the description of a gigantic Bacterium, *Spirillum colossus*, obtained by Prof. Errera from an ancient moat.

OUR BOOK SHELF.

Dynamos, Alternators and Transformers. By Gisbert Kapp. Translated from the third German edition by H. H. Simmons, A.M.I.E.E. Pp. v + 503. (London: Biggs and Co.) Price 10*s.* 6*d.*

Étude Pratique sur les Différents Systèmes d'Éclairage. By J. Defays and H. Pittet. Pp. 168. (Paris: Gauthier-Villars, n.d.) Price fr. 3.

MR. KAPP'S book has passed through a somewhat curious development. Originally written in English, it first appeared in German as a translation; subsequently Mr. Kapp revised, and to a large extent re-wrote, the German translation, the revised book appearing as the third German edition in 1899. It is this work which has now been translated by Mr. Simmons. The general merits of the book are probably known to most electrical engineers; those who are only familiar with the earlier English edition will find much that is new and valuable in the one now before us. After some opening chapters on the electric and magnetic theory underlying the design of dynamos, the winding of armatures is considered in detail in a couple of chapters well illustrated by diagrams. The next chapter deals with field magnets, after which armature reaction, commutation and sparkless collection are considered at some length. Some typical examples of direct-current machines are described, but at no great length, as this ground has already been covered by Mr. Kapp in his "Dynamo Construction: Electrical and Mechanical." The remainder of the book deals in a similar manner with alternators, synchronous and asynchronous motors, and rotary converters. Graphical methods are employed in this part to a considerable extent; the mathematical treatment throughout the book is clear and concise, a certain familiarity with the differential and integral calculus being assumed in the reader. As a whole the work forms a most valuable text-book for the student of this branch of electrical engineering.

It will be noticed that the book does not deal at all with transformers; this is because a separate work on this subject has been published by the author, a fact which is stated in the preface. Yet in spite of this, the title as it appears on the cover and page headings is "Dynamos, Alternators and Transformers," which is, to say the least, misleading. On the title-page a different, and more accurate, name is given to the book. This defect is to be regretted, as it mars an otherwise excellent work.

MM. Defays and Pittet's volume cannot fail to prove attractive to those who are interested in the problems of artificial lighting. The authors have aimed at providing a practical guide to those who are called upon to select, as, for example, for lighting a factory, a suitable system of illumination. Naturally, in such a case, the question of relative cost is of prime importance; the authors have, however, rightly abstained from dwelling too strongly on this point, as not only is the price so largely a question of locality, but it is often very difficult, if not impossible, to decide what is the monetary equivalent of the advantages which one illuminant possesses over another. The whole subject of artificial illumination is first dealt with in a general manner, the considerations of importance in relation to different conditions of use being pointed out. After this, separate chapters are devoted to a detailed examination of lighting by gas, acetylene, oil, alcohol and electricity. The principles underlying each system are expounded clearly and not too technically, and its security, healthiness and efficiency are discussed. From the hygienic point of view there can be no question as to the superiority of electric light; it is also more convenient, and probably safer, than any other method; but unfortunately it is considerably dearer, unless regarded from the enlightened standpoint which takes into account